

# ACRYLIC BONE PLATES FOR THE TREATMENT OF TIBIAL FRACTURES IN DOGS

\*V.G. Shanti<sup>1</sup>, Syam K. Venugopal<sup>2</sup> and M. K. Narayanan<sup>3</sup>

<sup>1</sup>M.V.Sc Student, <sup>2</sup>Professor, <sup>3</sup>Former Professor; Department of Veterinary Surgery and Radiology; College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur-680651.

\*At Present: Veterinary Surgeon, Kerala Animal Husbandry Deptt.

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The study was conducted on two clinical cases of tibial diaphyseal fracture in dogs presented for treatment. Plates made of polymethyl methacrylate (PMMA) were used for bone plating in buttress mode. Clinical and radiological evaluations were made preoperatively and post operatively at two week interval upto the eighth week of surgery. Primary healing was achieved in one case and secondary healing with minimal callus in the second case.

**KeyWords:** Acrylic bone plates, Dogs, Tibial Fracture.

Polymethyl methacrylate (PMMA) is a non metallic biomaterial, now used as one of the orthopaedics implants (Mahendra *et al.*, 2006). The PMMA implant is a radiolucent, non-carcinogenic, strong and biocompatible. Moreover, unlike most other implants, it does not interfere with computed tomography or magnetic resonance imaging studies. (Shivaprakash and Singh, 2006). The present study was conducted to evaluate the aim of evaluating the efficacy of acrylic bone plate for the stabilization of tibial fractures in dogs.

## Materials and Methods

The study was conducted on two clinical cases of dogs presented with complete fracture of tibial diaphysis, presented to the Surgery Units of Veterinary College Hospital, Mannuthy.

Case No. 1, was a four month old, female, Labrador dog weighing thirteen kilograms, which had injured its limb one month back while jumping. A plaster of Paris cast was applied at the time of injury, which had come off after a week. The functional limb usage at the time of presentation was '9' (places toe while standing, carries limb while walking), as per the scale of grading lameness.

Case No. 2, was a two year old male Spitz dog, weighing four kilogram which fractured its limb two days back due to external violence. The functional limb usage at the time of presentation was '10' (unable to place foot on ground).

Pre operative radiograph of Case No.1 (Fig. 1) revealed simple, complete, transverse fracture and fragments with serrated ends on both the major fragments.. In Case No. 2 (Fig. 2) the fracture was simple, complete transverse with overriding of the major fragments. After detailed clinical and radiographic examination, open reduction followed by internal fixation and stabilization of fracture fragments by plate osteosynthesis was recommended. A fracture plan was made in each case to prepare appropriate mould and to fabricate PMMA bone plate of desired dimensions. The approximate size, length and number of screws required were also judged from the fracture plan.

Plates were fabricated using DPI-RR Cold Cure, dental grade acrylic. A mould of the required length, width and thickness were first made with a sheet of aluminium. PMMA powder polymer and liquid monomer were mixed in the ratio (2:1) to form a gel. The mixture was poured into the mould and allowed to polymerize and cool to room

temperature. The plate was removed from the mould and with 3.5 size drill bit and the required number of holes were drilled into the

plate, with a gap of 1cm apart. A five hole and one four hole plates were made for Case No.s 1 and 2 respectively (Fig. 3 and 4).



**Fig : 1 Mid diaphyseal fracture of tibia – preoperative skiagram**



**Fig : 2 Fracture of tibia treated with acrylic plate–postoperative skiagram**



**Fig :3 Fracture of tibia treated with acrylic plate**



**Fig : 4 Fracture of tibia treated with acrylic plate–postoperative skiagram**

On the day of surgery, the patients were prepared for aseptic surgery. In both cases the right hind limb was clipped, shaved and scrubbed from above the stifle to below the hock region. Craniomedial approach to the fracture site was chosen. Povidone iodine solution was painted at the surgical site in a

centripetal manner starting from the incision site of surgery to the periphery. The dogs were premedicated with atropine sulphate at the dose rate of 0.045mg/kg body weight given intramuscularly, followed by xylazine hydrochloride administered at the dose rate of 2.0 mg/kg body weight intramuscularly.

Anaesthesia was induced by intramuscular administration of ketamine hydrochloride at the dose rate of 5.0 mg/kg body weight. Maintenance of anaesthesia was done by intravenous administration of a mixture of equal volumes of xylazine and ketamine in small increments of 0.2 ml to effect, followed by intravenous administration of diazepam at the dose rate of 0.2 mg/kg body weight. Plate osteosynthesis with acrylic plates was performed. Clinical and radiological evaluations were made post operatively on the 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup> and 8<sup>th</sup> weeks.

### Result and Discussion

The radiographs made immediately after fixation of implant in both cases revealed adequate reduction and alignment of fractured ends. The PMMA plates were not visible radiographically, since were radioluscent. Primary healing was achieved in Case No. 1. When fracture was accurately reduced and rigidly fixed, healing progressed without significant periosteal callus formation as also reported by Shanti *et al.*, 2022. Minimal callus formation was seen in Case No. 2 on the 2<sup>nd</sup> post operative week with increased fracture gap in the 4<sup>th</sup> week followed by gradual reduction of fracture gaps suggesting normal bone healing as also reported by Kumar *et al.* 2007.

Post operative follow up revealed that the weight bearing on fractured limb gradually improved with full weight bearing on the limbs attained by the 6<sup>th</sup> week postoperatively. Functional limb usage in Case No. 1 improved to 0 (sound) as observed on the 4<sup>th</sup> post operative week. In Case No. 2, the functional limb usage improved to 1 (mild lameness at slow trot, none while walking) as observed on the 8<sup>th</sup> post operative week.

Callus from each fragment met and fused to form a union between the fracture fragments. No reaction was found near the

fixation site of the plate in Case No.1 while slight exudation at the suture site was noticed in Case No.2. The wound was dressed and bandaged with povidone iodine in the second case which healed uneventfully by the eighth week. The plate was removed after the tenth week since there was occasional lameness and slight pain at the fractured site. Restricted activity was advised for two weeks.

The study showed that the use of acrylic plate was technically feasible as also reported by Yuvraj *et al.*, 2007, and clinically successful for plate osteosynthesis of tibial fractures in dogs. It proved ideal in light weight breeds and pups with body weight less than 15 kilograms as also mentioned by Shanti *et al.*, 2022.

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